# REPORT TO THE CONGRESS FROM THE PRESIDENT OF THE UNITED STATES

## MESSAGE

FROM

## THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

A REPORT ON THIS NATION'S AERONAUTICS AND SPACE ACTIVITIES FOR THE CALENDAR YEAR 1962, PURSUANT TO SECTION 206(b) OF THE NATIONAL AERONAUTICS AND SPACE ACT OF 1958, AS AMENDED



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# Chapter IV
# Department of Defense

## INTRODUCTION

As their contribution to the national space program, the Department of Defense, during 1962, expanded the research and development effort designed to keep the peace. These efforts are based on the belief that the capability to discourage or deter an attack via space is essential to keep the peace on this new frontier of man's endeavor.

DOD space projects fall into two principal categories: First, those projects directed at clear, identifiable military needs and requirements. Examples include the development of communications, navigation, and ballistic missile early warning satellite systems. The second class of projects is designed to investigate promising military space capabilities which will create a broad flexible technological base and to develop devices and subsystems which can be readily adapted for the design and engineering of major systems as future military space requirements and needs are identified: A prime example of a major project in this latter category is the TITAN III standardized launch vehicle which was approved for development in August 1962.

TITAN III will be capable of performing a wide variety of space missions involving a broad span of payload weights. It is expected to serve as a general purpose launch vehicle for more than a decade, performing a role in space operations for the DOD and NASA, as appropriate. Thus, it represents a major technological building block upon which the structure of the future military space capability will be built as part of the National Launch Vehicle Program.

Space efforts of the Department of Defense are fully coordinated with the activities of NASA and other government agencies in order to assure that planning for potential military applications of the future properly considers and applies all appropriate aspects of research and development in space with special emphasis on minimizing duplication Military space efforts are properly integrated as an essential element of a consolidated National Space Program in which many government agencies are participants.

Cooperation and accord at the management and operating levels in DOD and NASA contribute to the complementary characteristics of the collective space efforts. For example, the military communications satellite system is being developed to satisfy the peculiar requirements of the DOD for reliability, security, resistance to countermeasures, access to remote areas, and use by mobile units. It will supplement, but not replace or duplicate, space communications systems being developed by NASA and the electronics and communications industry.

Concurrent with its efforts to advance and exploit space technology, the Department of Defense sustained its traditional interest and participation in programs devoted to the advancement of aeronautics. Continuing progress in this important area was made during the past year.

Selected portions of the DOD program in the areas of space technology and aeronautics are highlighted in the following sections:

## SPACE DEVELOPMENT ACTIVITIES

### Standardized Space Boosters

During the year substantial progress has been made in developing standard configurations of our first generation of space boosters. These include the ATLAS and THOR boosters and the AGENA upper stage vehicle. Objectives of the standardization program are: increased reliability, increased producibility, increased flexibility in assignment of vehicles from one program to another and decreased overall space program costs.

The THOR space booster was standardized on a step by step basis during actual use. Initial standard THOR vehicles were delivered in mid-1962. The AGENA standardization was undertaken as a program on an accelerated schedule. Initial vehicles were delivered in April 1962 and flown in June and July 1962. The Standard Atlas program is being pursued in a similar manner to the AGENA program. Initial vehicles were delivered late in calendar year 1962.

### TITAN III

The TITAN III is a standardized space launch system which will be developed and utilized as part of the National Launch Vehicle Program as outlined in the joint agreement between the Secretary of Defense and the Administrator of NASA. This launch vehicle, to be developed by the Air Force, will meet Department of Defense and NASA future needs to place 5,000 to 25,000 pounds of payload in low earth orbits. The TITAN III takes full advantage of the Department of Defense's investment in the two stages of the TITAN II ICBM, with minimum modifications, along with large solid motors and a new upper stage as the essential building blocks.

The TITAN III system was the first large program to utilize new DOD procurement procedures. Before program approval was given, a program definition phase (Phase I) was established and funds were released in December 1961 to determine costs, vehicle performance, and appropriate model configuration, as well as to select the prime contractor and establish the overall DOD management organization. The Phase I program definition effort was completed in the second quarter of calendar year 1962 and the objectives of the Phase I efforts have been verified by the Air Force and the Department of Defense.

The basic program for TITAN III is believed better defined than any large scale development undertaken in many years. Unique new management arrangements have been established for the conduct of this program. One important aspect is that approximately 75% of Fiscal Year 1963 contract funds for research and development are being disbursed under incentive type contract arrangements. These contracts were fully defined before the program schedule was given a "go-ahead."

### TRANSIT

The TRANSIT satellite navigation system developmental program is progressing

as planned, and should be available for worldwide fleet operational deployment in the second quarter of calendar year 1963. During 1962, principal research efforts were concentrated on increased system reliability and accuracy, the refinement of refraction and geodetic data, satellite power and stabilization technology, and prototype development of shipboard navigation equipment.

The launch of TRANSIT IVB on 15 November 1961 marked the last planned launch of a TRANSIT satellite from the Atlantic Missile Range. All future launches - except for four THOR ABLE-STAR launches - are programmed for SCOUT vehicles to be launched from the Pacific Missile Range. A TRANSIT VA satellite was launched December 19, 1962.

When operational, the TRANSIT system will provide reliable, worldwide, all-weather navigation for important units of the Navy.

Communications Satellite Program

In May 1962, the Secretary of Defense re-oriented the Department of Defense communications satellite program. In this re-orientation, he directed the Defense Communications Agency to provide overall management and integrate the ground and space systems into the Defense Communications System. The Secretary directed the Air Force to develop two communications satellites - one a medium altitude system using many satellites, and one a synchronous altitude system using relatively few satellites. The Secretary directed the Army to develop the ground communications environment.

The Department of Defense has also continued its participation in NASA's SYNCOM program. Two fixed DOD ground stations neared completion at Fort Dix (New Jersey) and Camp Roberts (California), the installation of a terminal aboard the U. S. N. S. Kingsport was accomplished, and mobile stations were developed. Communications experiments utilizing the SYNCOM satellite will be conducted during 1963.

To provide experience for personnel who are participating in the NASA and DOD communications satellite programs and in order to evaluate past efforts of developing mobile terminals, a program was initiated utilizing ground stations developed for the commercial TELSTAR system.

The Navy, the Air Force, and the Army have communications programs aimed at utilizing the moon, and other passive and semi-active reflectors. Additionally, the Navy is considering the use of a satellite relay to communicate with submerged submarines.

X-20 Development

The X-20 project formerly DYNA-SOAR is aimed at the development of a small piloted glider to be boosted into space flight by a TITAN III booster from the Cape Canaveral missile test site.

The X-20 program is financed and administered by the Air Force and supported by the NASA. The purpose of the program is to construct and test a manned military space research vehicle which will explore the problems and conditions of hypersonic flight beyond the range of the X-15 research aircraft by achieving orbital velocity. The program will demonstrate the capabilities of pilot controlled re-entry and recovery from orbit. The pilot of the X-20 glider will have the ability

to control his return to earth by extending his flight path by several thousand miles straight ahead or to either side followed by conventional landing. This will enable the pilot to select the time when he will initiate re-entry and to control the point where he will land.

During 1962, the X-20 designs were finalized in conjunction with the selection of the TITAN III as the launch vehicle. Development on the glider subsystem has proceeded to a point where fabrication of the first gliders is expected to begin this year.

Inspector

Work is continuing on the Satellite Inspector Program to demonstrate rendezvous and inspection of a non-cooperative object in space by orbiting with it. Program assessment resulted in the termination of a prototype co-orbital demonstration system and initiation of an inspection system definition study. Efforts continued in close coordination with the NASA GEMINI program. A joint DOD-NASA study of both programs was accomplished and areas of mutual development effort identified.

ICBM Alarm

The objective of this program is the research and development of a space-based attack alarm system intended to maintain continous surveillance over ballistic missile launches on a global basis. Such a system would consist of unmanned satellites carrying infrared sensors which can detect ballistic missiles in powered flight as they emerge from the atmosphere.

During 1962 several technical advances were made in furthering this development. Infrared measurements from ground-based, airborne, and orbital tests yielded new scientific data on target and background discrimination techniques.

ANNA

The ANNA geodetic satellite program is a tri-service project under Navy management with NASA cooperation. The satellite combines three separate systems developed independently by the military services. The Navy system employs the principle of radio doppler, essentially that used in the TRANSIT navigation satellite. The Army system employs a radio ranging transponder called SECOR, that is, "Sequential Collation of Range." The Air Force system employs a high intensity flashing light or optical beacon.

Purpose of ANNA is to provide locations of tracking stations to an accuracy of 100 feet relative to the center of the earth, and to define the earth's mean attraction potential to an accuracy of 5 parts in 10 million. These accuracies are required to provide a framework for subsequent mapping, navigation, reconnaissance and other applications requiring this precision.

ANNA IA was launched on May 10, 1962 but did not achieve orbit due to the failure of the booster second stage.

ANNA IB was launched on 31 October 1962 and is presently furnishing geodetic data.

## Large Solid Propellant Motor Program

In accordance with the agreement between the Secretary of Defense and the Administrator of NASA, the Department of Defense is conducting advanced state-of-the-art technical development in the field of very large solid rocket engines with the dual objectives of advancing knowledge and the development of such engines.

Large solid motors with diameters up to 120 inches are already under development. A 100 inch diameter three-segment motor was successfully fired in February 1962. A 120 inch diameter motor, 40 feet in length, was fired in May 1962 producing 400,000 pounds thrust for a burning time of 130 seconds. On 15 September 1962, a 96 inch tapered diameter two center segment motor incorporating a dual thrust vector control system, hypergolic ignition, and a radial-segment motor was successfully fired. This development work has provided design data on grain configuration, burn rates, and internal pressures.

The development of large solid propellant motors with diameters of 156 inches and 260 inches is being investigated. The 156 inch motor is the largest segmented solid propellant motor capable of rail transportation from current production facilities to coastal launching sites. The 260 inch motor may demonstrate the feasibility of very large monolithic motors and provide technical foundations for further developments. Development of this large motor will also provide pertinent background data in procedures and processes for fabrication, propellant production and handling, testing and facility requirements.

## Nuclear Detection Satellite

A joint DOD/AEC program of satellite-based detection of nuclear tests in space is being conducted. Its objective is to confirm experimentally detector sensitivity, reliability, and system performance capability in the space environment by conducting experiments to obtain data on the background effects of the natural radiation environment in space. Of particular interest are possible natural radiations in space which might be similar to those expected from a nuclear detonation in space. The program consists of cooperative flights with other space programs and high altitude flights of spacecraft designed specifically for the program.

# AERONAUTICS DEVELOPMENT ACTIVITIES

## Laminar Flow Control Demonstration Aircraft

The laminar flow control aircraft program is intended to demonstrate that the design and manufacture of a wing capable of achieving laminar flow by means of suction through a large number of very fine slots in the surface is practical. It is intended to determine quantitatively through a full scale flight demonstration the magnitude of drag reduction possible and to assess the maintenance requirements in an operation environment,

The achievement of greatly reduced aerodynamic drag through laminar flow control would result in increased payload or range for aircraft designed to incorporate this feature. The FAA has assisted in financing the program which is also of interest to nonmilitary activities. Two demonstration aircraft are designed X-21A's.

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## Space Power Equipment

The Department of Defense continued to examine various concepts for meeting the anticipated high electrical power requirements of future satellites. For possible requirements of more than several hundred watts careful consideration has been given to both nuclear and solar powered generators. In 1962, significant management action was accomplished to insure vigorous development of a nuclear power unit to generate several hundred kilowatts of electrical power.

SPUR was initiated in 1960. The study, design and test effort has thus far evolved a power system concept which uses a liquid metal cooled fast reactor supplying thermal energy by means of a potassium Rankine cycle conversion loop to turbine driven electric generator. The tests conducted included material compatibility tests, both static and dynamic, fuel element property evaluations, compatibility tests of the fuel element materials and cladding, creep-rupture tests of the turbine and pump materials, potassium-lubricated-bearing tests, and boiling and condensing potassium heat transfer tests.

The Department of Defense by letter dated October 2, 1961, requested the Atomic Energy Commission to expand its efforts in experimental space power reactors toward the SPUR design criteria. In the ensuing months, the AEC initiated the SNAP-50 reactor development in the power range needed by SPUR. Meetings between the Chairman, AEC, the Administrator of NASA, and the Secretary of the Air Force resulted in a memorandum of understanding between DOD, AEC, and NASA on the management by AEC of an integrated SNAP-50/SPUR program.

Progress was made during the year in the SNAPSHOT program which is a companion to the AEC SNAP program. SNAPSHOT will provide vehicles and services for orbital proof tests of SNAP 10A and SNAP 2. The first orbital flights of this program are scheduled for 1964 and will use the ATLAS/AGENA launch vehicle to place SNAP 10A in orbit.

## Hi-Definition Radar

A program has been initiated to demonstrate a technological capability to build high resolution, long range, space tracking radar.

The program is intended to provide the technology necessary for greatly improved detection, identification and tracking of orbital or ballistic objects.

## Infrared

Infrared detectors have been developed which have many applications in satellite and space systems. Satellite systems require IR detectors for horizon scanners used in vehicle stabilization, in star trackers used for navigation, for IR space communications, for detection and tracking systems used for satellite rendezvous, and various other applications. Presently available long wave length detectors, with response in the S-14 micron region (necessary for cold body detection) require cooling to liquid nitrogen, neon, hydrogen, and even helium temperatures (-268.9°C). Special minature cryostats, requiring low power input, but reliably providing these temperatures continuously for long periods of time, are being developed. Long wave length detectors requiring less cooling, or no cooling at all,

must also be developed for greater reliability and lower electrical power requirements.

## Ultraviolet

The ultraviolet region of the spectrum is also being explored primarily from the point of view of utilizing this region for image formation outside the earth's atmosphere where ultraviolet energy is not attenuated. Ultraviolet background measurements have been made in cooperation with NASA.

Extensive work in the field of optics in recent months has provided many advancements of considerable importance to peaceful exploitation of the aerospace environment. Optical sensors have long been recognized as providing a means toward achieving high resolution and high angular accuracy, but to achieve this potential high performance, large diameter optical elements and mirrors are required. Recent experiments have resulted in new lightweight mirrors of large diameter capable of maintaining a precise optical shape.

## LASERS

The explosive field of LASER (Light Amplification by Stimulated Emission of Radiation) research is also resulting in techniques that will make this device a valuable tool, in connection with optical sensors, for many operations in aerospace vehicles. It will provide extremely sensitive and high resolution devices, for example, guidance and exploration.

In this area of research, there has been extensive coordination even on an international basis. The recent NATO-SADTC Symposium on Technical and Military Applications of LASER Techniques was held in France, summer of 1962.

## Data Handling

The many problems associated with handling pictorial data or the output of imaging sensors is also under study. Photo-tape is one result of these efforts. It is essentially like the sensitive element of a TV picture tube except that it is flexible and can be rolled up and the information stored for later readout. It is relatively insensitive to nuclear radiation, reuseable and combines some of the best features of TV and photography. It is being considered for use in the NIMBUS type meteorological satellites. The effect of radiation, which exists more intensely in space, on photography and image forming systems is being evaluated. The effect of the earth's atmosphere on image forming sensors is also under extensive study. Atmosphere affects performance of sensors in three ways. The natural turbulence places a limit on resolution under some conditions of operation, induced turbulence due to passage of a vehicle through the atmosphere places other limitations, and, finally, depending upon vehicle skin temperature and meteorological conditions, the atmosphere reduces the ability of an image forming sensor to provide proper contrast discrimination. These problems and techniques for solving them, carry high priority and success in this field has many peaceful applications.

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# Chapter VI
# Department of State

## INTRODUCTION

In 1962 world interest in outer space activities was reflected with the beginning of implementation of the United Nations resolution on outer space, adopted in late 1961 at the initiative of the United States and with the reactivation of the United Nations Committee on the Peaceful Uses of Outer Space.

The Department of State continued to direct United States efforts in the United Nations aimed at increased cooperation in outer space activities and definition of the legal and political aspects of outer space exploration. The Department also continued to effect new agreements and maintain old agreements for technical support for United States programs in other countries and programs of international cooperation in space science efforts. In addition, the Department continued its activities in the formulation of national policy in the legal and political aspects of outer space activity.

## ACTIVITIES WITHIN THE UNITED NATIONS

During the year the United States directed its efforts to the implementation of the provisions of General Assembly Resolution 1721 (XVI) adopted unanimously on December 20, 1961 on our initiative. The United Nations Committee on the Peaceful Uses of Outer Space, as reconstituted by that resolution, met twice in 1962 -- March 19-29 and September 10-14. The March meeting established two subcommittees, one charged with exploring practical means to advance international cooperation in the scientific and technical aspects of space activity, and the second to study and report on legal problems which may arise in the exploration and use of outer space. The Scientific and Technical Subcommittee, which met in Geneva on May 28, agreed upon a number of proposals for international cooperation through the United Nations. These recommended: (1) An exchange, on a voluntary basis, of information relating to national, regional, and international programs of peaceful space research, and of information on governmental and non-governmental international bodies active in space research; (2) That United Nations Specialized Agencies and Member States support the program of scientific cooperation during the International Year of the Quiet Sun (1964-1965) to be undertaken by the International Council of Scientific Unions, and the program sponsored by the same organization for a World Magnetic Survey; and (3) The establishment under U. N. auspices of a sounding rocket launch facility, or facilities, on the geomagnetic equator in time for the International Year of the Quiet Sun. The recommendations, in the main, stemmed from proposals made by the United States.

The Scientific and Technical Subcommittee also considered reports by the World Meteorological Organization and the International Telecommunication Union on those aspects of space meteorology and space communications in which international cooperation would be useful, but took no specific action with reference to recommendations included in either of these reports.

In the Legal Subcommittee, which also met in Geneva on May 28, the United States delegation presented a proposal on the liability of states for space vehicle accidents, and a draft General Assembly resolution on assistance to and return of space vehicles and personnel. Under the former, the Secretary General of the United Nations would have been requested to constitute an advisory panel of legal experts charged with the task of preparing an international agreement. The draft GA resolution recommended to States that they render assistance to personnel of space vehicles who might be the subject of accident or experience conditions of distress and that they return space vehicles and personnel that might land otherwise than as planned. The Soviet Union had earlier tabled a draft declaration of general principles and a draft international agreement, rather than a General Assembly resolution, on assistance to and return of space vehicles and personnel.

Significant elements of the Soviet draft proposals were unacceptable to a majority of the Subcommittee. Although the United States was prepared to modify its proposals in the interest of reaching agreement, the Soviet Union was unwilling to consider the questions of liability and of rescue and return in the absence of agreement by the Subcommittee to go forward with the Soviet draft declaration of principles. The Legal Subcommittee adjourned without reaching any agreements as to substance or procedure.

At the September meeting of the full Committee, the recommendations of the Scientific and Technical Subcommittee were adopted and forwarded in the Committee's report to the General Assembly. There was lengthy discussion on legal problems with, however, no agreement resulting. Five draft proposals on these legal questions were submitted to the General Assembly with the Committee's Report.

The Political Committee of the General Assembly began consideration of the Report of the U. N. Space Committee on December 3. The United States Representative led off the debate with a major address outlining United States space policy and reviewing the history of our leadership in sponsoring international cooperation in outer space.

The United States presented a resolution which called for General Assembly approval of the recommendations endorsed by the Space Committee on technical and scientific cooperation. The United States subsequently agreed to the inclusion in its resolution of a section which would recommit legal questions to the Space Committee. The resolution, as adopted unanimously by the Political Committee on December 11 and the General Assembly in Plenary on December 14, requested the Space Committee to continue its work on legal questions including the elaboration of legal principles to govern the activities of states in the exploration and use of outer space, liability for space vehicle accidents, assistance to and return of astronauts and space vehicles, and other legal problems. Those sections of the resolution approving the scientific and technical recommendations of the U. N. Space Committee were retained as originally presented by the United States Delegation.

During the debate the United States also introduced a draft declaration of legal principles to guide states in their outer space activities. Since agreement was reached on remanding legal questions to the Outer Space Committee, neither this proposal nor draft proposals presented by other delegations were put to a vote.

In response to General Assembly Resolution 1721 (XVI), paragraphs 1 and 2, the United States has registered with the U.N. Secretariat all United States objects in orbit since mid-February, 1962. Information provided gave the international serial designation of the objects launched into orbit or beyond, the launch vehicle, date of launch, satellite category, and orbital elements. After an initial report as of February 15, 1962, supplementary reports were submitted to the U.N. Secretariat on a twice-monthly basis.

## OTHER INTERNATIONAL ACTIVITIES

In 1962, the United States continued to follow a policy of cooperation with other nations in space research. Among the more significant of these efforts was an agreement with the Soviet Union to cooperate on a limited number of space experiments. In March 1962, following the successful flight of John Glenn, Premier Khrushchev indicated to the President that the U.S.S.R. would be interested in undertaking a program of cooperation in outer space activities with the United States. With the support of the Department, Dr. Hugh L. Dryden of NASA met with Professor Blagonravov of the U.S.S.R. to have technical discussions on possible areas of cooperation. As a result of these conversations, technical arrangements for three specific cooperative programs were agreed ad referendum to the U.S. and Soviet Governments. The three projects involve (1) exchange of weather data from satellites, (2) a joint effort to map the magnetic field of the earth by means of coordinated launchings of geomagnetic satellites and related ground observations, and (3) cooperation in the experimental relay of communications via the ECHO satellite. In October, the President of the Academy of Sciences of the U.S.S.R. informed the Administrator of NASA that the proposed agreement was satisfactory to the U.S.S.R. The NASA Administrator replied with the concurrence of the United States. The technical agencies of the two nations will soon commence steps to implement the projects which have been agreed upon.

On December 5 the United States and Soviet Representatives to the United Nations in a joint letter informed the U.N. Secretary-General of the agreement.

In other significant developments in international cooperation, the Department of State concluded an agreement with Italy for a program of launching Italian satellites from Texas Tower-type launching platforms in the Indian Ocean using United States boosters. Agreements were also reached with India and Japan for cooperation in communications satellite experiments utilizing the RELAY and TELSTAR communications satellites.

In addition to these new cooperative programs, there was continuing support of NASA in the implementing and extending of cooperative programs with other countries including Sweden, Norway and Denmark, Pakistan, Japan, Italy, Canada and the United Kingdom. In this connection, the first two foreign satellites, the U.K. ARIEL and the Canadian ALLOUETTE, were launched by NASA in 1962.

The Western European nations continued to demonstrate a growing interest in space activities and the conventions for a European Space Research Organization (ESRO) and a European Launcher Development Organization (ELDO) were agreed, subject to ratification by the participating governments. The Department established general guidelines within the Executive Branch for responding to approaches from ELDO and ESRO for assistance.



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